

FURNACE RESIDUE CLEANING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to method for cleaning a furnace residue, and more particularly to a residue cleaning method using water to remove lime powder from the residue and recycle the used water to preserve the environment.

2. Description of Related Art

Residue in an iron smelting furnace may be processed to increase the economic efficiency for the business. A complete cycle post-treatment of the residue includes four processes, namely the residue pre-treatment process, the residue processing process, the residue curing process and the residue refining process. However, not each process is adopted by the operator in the business. The four processes are more or less modified to meet different requirements. The focus of this invention aims at the residue processing process. The purpose of residue processing process is to crush the residue, select the available residue, categorize the selected residue and select the residue containing steel over 55% in weight for further processing, such as sintering. The selected residue may be applied as additives for steel refining, cement or even for road engineering or landscape construction.

The conventional residue processing method is divided into the following two

different methods.

With reference to Fig. 2, the first method uses a container to collect the residue.

22 The residue is transferred to a crushing device to minimize the size of the residue. The
23 crushed residue is then selected by a magnetic device to select the parts containing iron
24 therein such that the iron can be retrieved for other applications. Thereafter, a

1 categorizing device is supplied to categorize the residue according to the residue
2 dimension. Then the residue is screened further for different applications by a screening
3 device. It is noted that in this method, when the residue is taken out of the furnace, water
4 is required to cool the residue. However, using water to cool the residue causes the lime
5 powder to attach to the outer portion of the residue, which results in that the magnetic
6 device or a different classifying process is not able to accurately categorize the residue.
7 Even worse, sometimes, the mesh of a screen may be blocked by the residue mixed with
8 lime powder and thus the entire operation is delayed and of course the quality of the
9 selected residue is not satisfactory.

10 Further, a lot of additives are required during the steel processing period. The
11 additives normally contain a large amount of lime which has a pH value between 10~11.
12 Thus when the selected residue is used in road construction, the alkaline nature seriously
13 contaminates the environment. Other residue not fully recovered for further application
14 is a waste of material.

15 With reference to Fig. 3, the other conventional method contains a further
16 drying process to remove all the moisture in the residue, such that the lime powder is not
17 attached to the residue and the mesh blockage problem is solved.

18 Although the second conventional method does meet the requirement to
19 separate the lime powder and the residue, the method still suffers from the following
20 several problems:

21 expense :In addition to the cost of the installation of the drying machine, the
22 lime powder suspended in the air requires an air filtering machine to filter the air so that
23 the total cost is high.

24 low efficiency: because the process requires the entire residue to be fully dried

1 for further processing, the amount of the residue material to be dried can not be too
2 much, otherwise, the entire process will be delayed and therefore lead to a low
3 efficiency.

4 air pollution: Even with the use of the air filtering machine, the dust in the air is
5 only reduced and can not be eliminated entirely.

6 high maintenance cost: The maintenance, operation and repair of all the
7 machinery require a large amount of capital to keep everything in order.

8 To overcome the shortcomings, the present invention tends to provide a method
9 to mitigate the aforementioned problems.

10 **SUMMARY OF THE INVENTION**

11 The primary objective of the present invention is to provide a method to use
12 water to clean the residue of a furnace so that the lime powder and the residue from the
13 furnace are separated.

14 Another objective of the present invention is that the used water produced from
15 washing away the lime powder from the residue from the furnace is recycled such that
16 the lime powder is able to be collected.

17 Other objects, advantages and novel features of the invention will become more
18 apparent from the following detailed description when taken in conjunction with the
19 accompanying drawings.

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

21 Fig. 1 is a flow chart showing the process of the method of the present
22 invention;

23 Fig. 2 is a flow chart showing the first conventional method to clean the residue;
24 and

1 Fig. 3 is a flow chart showing the second conventional method to clean the
2 residue.

3 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

4 With reference to Fig. 1, the residue out of a furnace (not shown) is collected in
5 a container (1). A sprinkling system is provided in a screening device (2) to screen out
6 residue of different sizes, i.e. above 30mm, 12~30mm, 8~12mm and below 8mm.
7 During the screening process, the sprinkling system continuously provides water to
8 separate the lime powder from the residue and the lime powder mixed with water flows
9 to a deposition tank (3).

10 After the residue is selected and categorized into the aforementioned four
11 classes, the residue of different sizes is sent to different magnetic selection devices
12 (41,42,43,44) for selection of residue containing different amounts of iron therein. The
13 12~30mm class is divided into two subclasses for building construction material and
14 road construction material. The 8~12mm class may be applied for use as building
15 construction material.

16 The residue with a dimension under 8mm is sent to a sand separation device (5)
17 to filter out the sand contained in the water. The filtered-out sand is able to be supplied
18 as a material for sidewalk slabs or bricks. The water passing through the sand separation
19 device (5) flows to the deposition tank (3) for deposition of both sand and lime. The
20 deposited sand and lime may be applied for other applications at a later time. During the
21 deposition of the lime and the sand, the water is collected in a water tank (7) and then
22 recycled to the sprinkling system of the screening device (2) for reuse.

23 The residue with a dimension above 30mm is sent to a crushing device (6) to
24 minimize the size of the residue and then the minimized residue passes through a

1 different magnetic device (45) for selection of residue containing iron. Thereafter, the
2 residue is sent to a second container (11) for collection and to a grinding device (7) for
3 grinding. After passing through the grinding device (7), the residue is sent back to the
4 container (1) to repeat the previous steps.

5 After the description, it is noted that the method of the present invention has the
6 following advantages:

7 dust prevention: Because the residue is collected in the container and the water
8 in the screening device (2) washes away the lime powder, dust such as lime powder is
9 eliminated and thus surrounding air is clean.

10 full recycling: After the washing process, the lime powder is collected and
11 deposited in the deposition tank (3), thus the lime may be collected for use as cement
12 ingredient.

13 environmental protection: Due to the removal of lime powder from the residue,
14 the residue used for road construction is safe for application to the ground and thus the
15 environment is protected from contamination.

16 It is to be understood, however, that even though numerous characteristics and
17 advantages of the present invention have been set forth in the foregoing description,
18 together with details of the structure and function of the invention, the disclosure is
19 illustrative only, and changes may be made in detail, especially in matters of shape, size,
20 and arrangement of parts within the principles of the invention to the full extent
21 indicated by the broad general meaning of the terms in which the appended claims are
22 expressed.